Role of Tissue Expander in Yemeni Post Burn Patients, Post Traumatic Scars, and Defects Management

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ABSTRACT

Background: the increment in incidence of post burns and post war injuries scars, pigmentations , cicatricial alopecia and defects cases due to the bad health and economic conditions caused by war in Yemen and their effects on these patients physically, aesthetically and psychologically is the main reason of this study. Tissue expansion was used to correct these scars, pigmentations and defects by using the tissue expander. We aim in this study (the first study in Yemen) to demonstrate the effectiveness of this modality in management these scars and defects and identified its success and failure factors and managed them to achieve good results and superior aesthetic outcome.

Patients and Methods: This study is prospective study was conducted on 50 cases Used tissue expanders with 50 - 550cc capacities in different body areas during the period from January 2020 to January 2024. more than half of participants (62.0%) were female and (38.0%) were male. The participants' mean age was 22.7±7.8 years. majority of injuries were located on the scalp (30.0%), followed by the neck (28.0%), face (16.0%), extremities (12 .0%),

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forehead (8%) and chest (4.0%) and abdomen (2.0%). The most common cause of injury was post-burn complications.

Result: The majority of operations were successful, with 78.0% of patients reporting satisfaction. Most cases did not exhibit any complications (86.0%), while some had minor salvageable (10.0%) or major unsalvageable complications (4.0%). The study found no significant relationship between variables such as age, sex, injury location, cause, concomitant tissue expander use, and previous expansion with operation outcomes or complication.

Conclusion: Tissue expansion modality is effective method for post burn and post injuries complications correction with more than three quarters (78%) satisfied results, and remote incision for device insertion dealing some complications like wound dehiscence.

Key words: scar – expander – aesthetic – cicatricial – explantation

INTRODUCTION

Bad economic and health conditions in Yemen due to war initiated in the last years resulted in an increment in the incidences of cases with post burns and post injuries scars, contractures, alopecia and lost organs or structures that affected on body aesthetically resulted in an unpleasant, ugly and unsightly appearance. There was also an increase in mental health conditions characterized by depression and anxiety disorders and isolation that may end with suicidal thoughts.

These patients are their aesthetic appearance to looking forward to improve pre injuries normal or near-normal state and to regain confidence. Modern medicine offers many solutions to patients suffering from skin conditions, these include skin graft, flaps, laser and fat injections to manage scars and defects. However, patients seek better solutions that can offer superior results.

Expanded tissue is a helpful option for complicated cases like individuals lacking skin **(Harris et al.; 2023);** and it's regarded as one of the key methods in

plastic surgery, helping with scar tissue treatment, ear reconstruction, breast reconstruction, and other areas in addition to fixing flaws in the scalp **Deng et)** Additionally, it offers an **;(al.; 2020 and Karimi et al.; 2019**excellent match in terms of color, texture, ability to support hair, and sensation to the recipient site **(Braun et al.; 2016 , Trebuňová et al.; 2019 and Cho et al.; 2024)**. According to more recent research; tissue expansion has been used to treat a range of congenital and acquired abnormalities in children and adults **(Tzolova & Hadjiiski, 2008)**. Neumann was the first to recognize in 1957 that tissue expansion might be used in reconstructive surgery. He positioned a balloon under the temporal region to simulate the absence of an ear.In1976, Radovan underwent a mastectomy and restored his breasts using the tissue expander technique. Since then, tissue expansion has grown in favor among plastic surgeons, and for many congenital and acquired abnormalities in both children and adults, it is currently the recommended course of therapy **(Cunha et al.; 2002, Wagh & Dixit, 2013 and Braun et al.; 2016)**.

We aim To investigate the relevance and success of this modality as effective method with superior aesthetic results by its advantages above mentioned (like with like tissue) in management these scars and defects and determine the areas of the body with high success and failure rate with identify the factors leading to complications and how we manage them. TEs are not without drawbacks: a lengthy process of expansion, expensive, the need for multiple operations, and a temporary aesthetic deformity that may not be tolerated .**(Langdell et al.; 2021)**

PATIENTS AND METHODS

This study is prospective study conducted on 50Patients with obvious post burn scars post burn cicatricial alopecia and post traumatic and war injuries defects in different body areas. All patients included in the study have been undergone all the stages of the correction from January 2020to January 2024 in units of plastic and reconstructive surgery with 8 to 12 weeks follow up in

Typical police hospital, Military hospital, Elite hospital, Yemeni Germani hospital, Al - gumhori teaching hospitals, Sana'a city- Yemen.

Adequate patients' consultation and written informed consents from all included patients were full filed. Based on a previous study, rectangular tissue expanders are believed to have more expandability compared to crescent and round ones. (**Fattah J.H; 2014**).

Therefore, we used rectangular tissue expanders in all cases with (50to 550ml.) capacity. They were selected suitable to be inserted under the donor tissue and generate the proposed expansion .

At the day of expander insertion, preoperative marking of the original incision site, anatomical sites of vital structures and proposed subcutaneous pocket was done.

Operative technique:

All surgeries were performed under general anesthesia. by scrub povidone iodine the operation area was prepared. diluted adrenaline solution (from1/100000 to 1/200000) was injected to both the incision site of implantation and pocket subcutaneous area for hemostasis purpose. Limited skin incision (4-6cm) is done at the edge of the scar near the pocket side and later we placed the incision in remote area away from the pocket as we found that the overcome on some complications like wound dehiscence at defects border and in to dealing for another salvageable complications like hematoma and seroma evacuation without device exposure and the explantation probability. also this remote incision has advantage the early tissue expander injection in few days without fearing the wound dehiscence and decreasing the long period between the two procedures. then subcutaneous pocket creation performed using fine skin hooks and sharp scissor for dissection in subcutaneous plan and in subgaleal in scalp with careful dissection10-20% larger than the tissue expander size. Hemostasis was obscured with bipolar diathermy. Changed the gloves and examination the device for safety and leakage and evacuated the air inside it

then washed with antibiotic (Gentamicin 160mg mixed with 100cc normal saline) before device implantation. During the insertion procedure, knuckling and bending of the device or tube were carefully avoided. Injection port put in away pocket and must be distinguishable and accessible for the following injections.

Again, irrigation the device in the pocket with solution (local antibiotic +saline +diluted povidone iodine) was done before wound closure with proline sutures. Normal saline, 10% to 20% percent of the tissue expander volume, was injected as required. This induces an average pocket wall intrinsic compression with not much tension to the repaired wound. After the surgery, with the use of sterile gauze the wounds were dressed.

According to the wound state, 10 to 15 days postoperatively(but started early in 5 days postoperatively inflation in case of remote incision away from the pocket), the expander inflation began and continued at 4-7 days intervals(delayed the injection more days in case of thin subcutaneous tissue as this improved the tissue expander exposure complication. The wound must be free of any sign of infection, inflammation, or discontinuation to start the expander inflation. It has been continued on average 6 to 8 weeks long according to the needs and the site of the surface area to reconstruct. We relied on blanching of the skin and the patient discomfort or 10% of expander capacity to determine the safe filling endpoint indicator. The expander inflation must be at least 10-20% more than the proposed size of the area planned to be excised to compensate the elastic recoil of the facial skin. Afterwards, we removed the expander in the second stage surgery. at this stage after device explantation advancement the flap to the defect or scar site after its excision then adjusted the flap according to the size and shape of row area and closure the wound was taking afterwards in two layers.

Surgical Procedure Steps For Tissue Expander Implantation With Remote Incision

Marking the incision site in remote area from the pocket marking.

Infiltration the diluted adrenaline (from 1/100000 to 1/200000) in both the incision site and in the pocket area in subcutaneous tissue for the hemostasis purpose.

Surgical Incision for device implantation in remote area from the pocket areas creation.

Dissection in subcutaneous plan for device pocket creation.

Immersion the tissue expander in solution of antibiotics and normal saline.

Immersion the tissue expander in solution of antibiotics and normal saline.

Tissue expander implantation in the pocket in subcutaneous plan.

Pocket irrigation with local antibiotics and normal saline before wound closure

Closure the surgical incision site of insertion in a layer.

Intraoperative tissue expander injection with normal saline 10% of its capacity.

Data was collected through a questionnaire prepared by the researcher*:*

Demographic Data: This section included information such as age, sex, cause of injury, and location of the injury .

Medical History and Surgical Outcome: This section covered details regarding concomitant tissue expander, history of previous expansion, the outcome of the operation, and any complications observed . Complication were assessed major (infection, tissue expander exposure, wound dehiscence) and unsalvageable that end with explantation and minor complications (seroma and hematoma) but salvageable with continuation the process. Regarding technical success if no complication during the process and ends with good result it was considered "satisfied". if complicated and unsalvageable with ending the process, it was considered "failure" and if salvageable it was considered "fair."

The analysis were performed using IBM-SPSS 28.0(IBM-SPSS Inc., Chicago, IL, USA). Descriptive statistics: Means, standard deviations (SD) percentages were calculated. Significance test: Chi-square/Fisher's exact test was used to compare the differences in frequency between groups.

RESULTS

The current study involved 50 participants, more than half of them (62.0%) were female while (38.0%) of the population were male, Additionally, the mean age of the population was 22.7 years with a standard deviation of 7.8 years. The age distribution showed that more than one third (38.0%) were aged between 18-25 years, 30.0% of the population is less than 18 years, more than quarter (26.0%) aged between 26-35 year, and 6.0% are over 35 years old.

Table (4.1) Participants demographic data (n=50).

	Variables		Frequency	Percentage
Gender		Male	19	38.0
		Female	31	62.0
Age		Mean ± SD	22.7 ± 7.8	
		9 – 17	15	30.0
		18 – 25	19	38.0
		26 – 35	13	26.0
		More than 35	3	6.0

Notably, the scalp demonstrated the highest frequency at (30.0%), followed closely by the neck (28.0%), face (16%), both extremities (12%) and chest (4%). Conversely, the abdomen exhibits the lowest frequency (2.0%).

Table (4.2): Distribution of the participant by location of the injury (n=50).

Location of the injury	Frequency	Percent (%)
Scalp	15	30.0
Forehead	4	8.0
Face	8	16.0
Neck	14	28.0
Upper extremities	3	6.0
Lower extremities	3	6.0
Chest	2	4.0
Abdomen	1	2.0
Total	50	100.0

The data provided outlines the frequency and percentage distribution of various causes of injury. Post burn scarring and pigmentation accounts for the highest percentage (52.0%), followed by post burn alopecia (30.0%), post trauma defects (16.0%), and post trauma alopecia had the lowest percentage (2.0%).

Table (4.3): Distribution of the participant by cause of the injury (n=50).

Cause of injury	Frequency	Percent
Post trauma alopecia	1	2.0
Post burn scaring and pigmentation	26	52.0
Post traumatic defect	8	16.0
Post burn alopecia	15	30.0
Total	50	100.0

The **Table (4.4)** for concomitant tissue expander usage indicated that that a more than half of the cases (60%) involved the concomitant use of a tissue expander, while 40.0% did not.

Table (4.4): Concomitant tissue expander

Concomitant tissue expander	Frequency	Percent
Yes	30	60.0
No	20	40.0
Total	50	100.0

In terms of previous expansion, only 8.0% of cases had a previous expansion, while 92.0% did not.

Table (4.5): history of previous expansion

Pervious expansion	Frequency	Percent
Yes	4	8.0
No	46	92.0
Total	50	100.0

The outcome of the operation revealed that more than three-quarters (78.0%) of cases were satisfied, 18.0% were fair, and 4.0% resulted in failure.

Table (4.6): Outcome of operation

Outcome of operation	Frequency	Percent (%)
Satisfied	39	78.0
Fair	9	18.0
Failure	2	4.0
Total	50	100.0

Regarding complications of the operation the data revealed that 86.0% of cases did not exhibit any complications, while 10.0% had minor complications and 4.0% experienced major complications. The types of complications varied, with 6.0% involving tissue expander exposure, 2.0% involving tissue expander exposure and seroma, 2.0% involving tissue expander exposure and infection, and 2.0% involving seroma and wound dehiscence. Additionally, 2.0% of cases experienced tissue expander exposure and dehiscence. The end of complications was salvageable in 10.0%, and unsalvageable in 4.0%.

Table (4.7): Complications of operations

Complications of operations		Frequency	Percent	
Presence of Complications	No Yes, minor	43 5	86.0 10.0	
	Yes, major	2	4.0	
Types of complications	No complication tissue expander exposure	43 3	86.0 6.0	
	tissue expander exposure and seroma	1	2.0	
	tissue expander exposure and infection	1	2.0	
	Seroma and wound dehiscence	1	2.0	
	tissue expander exposure and dehiscence	1	2.0	
End of complications	No complication Salvageable	43 5	86.0 10.0	
	Unsalvageable	2	4.0	

By chi square test there was no significant relationship between age, sex, location of injury, cause, concomitant tissue expander, and previous expansion, with outcomes of operations.

Table (4.8): Relationship between age, sex, location of injury, cause, concomitant tissue expander, and previous expansion, with outcomes of operations.

Variables		Results						P. value
		Satisfied		Fair		Failure		
		Coun t	Row %	Co unt	Row %	Co unt	Row %	
Age	9-17	13	86.7%	2	13.3%	0	0.0%	.187
	18 - 25	15	78.9%	3	15.8%	1	5.3%	
	26 - 35	10	76.9%	3	23.1%	0	0.0%	
	More than 35	2	66.7%	0	0.0%	1	33.3%	
Sex	Male	16	84.2%	1	5.3%	2	10.5%	.063
	Female	24	77.4%	7	22.6%	0	0.0%	
location	Scalp	13	86.7%	2	13.3%	0	0.0%	0.326
	Forehead	3	75.0%	1	25.0%	0	0.0%	
	Face	7	87.5%	1	12.5%	0	0.0%	
	Neck	10	71.4%	3	21.4%	1	7.1%	
	Breast	0	0.0%	0	0.0%	0	0.0%	
	Upper extremities	3	100%	0	0.0%	0	0.0%	
	Lower extremities	2	66.7%	0	0.0%	1	33.3%	
	Chest	2	100%	0	0.0%	0	0.0%	
	Abdomen	0	0.0%	1	100.%	0	0.0%	
	Face and neck	0	0.0%	0	0.0%	0	0.0%	
	Thigh	0	0.0%	0	0.0%	0	0.0%	
Cause	Post trauma alopecia	1	100%	0	0.0%	0	0.0%	.842
	Post burn	20	76.9%	5	19.2%	1	3.8%	
	Post trauma	6	75.0%	1	12.5%	1	12.5%	
	Post burn alopecia	13	86.7%	2	13.3%	0	0.0%	
Concomitant tissue expander	Yes	24	80.0%	5	16.7%	1	3.3%	.949
	No	16	80.0%	3	15.0%	1	5.0%	
Previous expansion	Yes	4	100%	0	0.0%	0	0.0%	.581
	No	36	78.3%	8	17.4%	2	4.3%	

By chi square test there was no significant relationship between age, sex, location of injury, cause, concomitant tissue expander, and previous expansion, with complications of operations.

Table (4.9): relationship between age, sex, location of injury, cause, concomitant tissue expander, and previous expansion, with complications of operations.

Variables		Complications						P. value
		No		Yes, minor		Yes, major		
		Count	Row %	Count	Row %	Count	Row %	
Age	9-17	14	93.3%	1	6.7%	0	0.0%	.162
	18 - 25	15	78.9%	3	15.8%	1	5.3%	
	26 - 35	12	92.3%	1	7.7%	0	0.0%	
	More than 35	2	66.7%	0	0.0%	1	33.3%	
Sex	Male	16	84.2%	1	5.3%	2	10.5%	.138
	Female	27	87.1%	4	12.9%	0	0.0%	
location	Scalp	13	86.7%	2	13.3%	0	0.0%	.719
	Forehead	3	75.0%	1	25.0%	0	0.0%	
	Face	7	87.5%	1	12.5%	0	0.0%	
	Neck	12	85.7%	1	7.1%	1	7.1%	
	Breast	0	0.0%	0	0.0%	0	0.0%	
	Upper extremities	3	100%	0	0.0%	0	0.0%	
	Lower extremities	2	66.7%	0	0.0%	1	33.3%	
	Chest	2	100%	0	0.0%	0	0.0%	
	Abdomen	1	100%	0	0.0%	0	0.0%	
	Face and neck	0	0.0%	0	0.0%	0	0.0%	
	Thigh	0	0.0%	0	0.0%	0	0.0%	
Cause	Post trauma alopecia	1	100.%	0	0.0%	0	0.0%	.845
	Post burn	22	84.6%	3	11.5%	1	3.8%	
	Post trauma	6	75.0%	1	12.5%	1	12.5%	
	Post burn alopecia	14	93.3%	1	6.7%	0	0.0%	
Concomitant tissue expander	Yes	26	86.7%	3	10.0%	1	3.3%	.957
	No	17	85.0%	2	10.0%	1	5.0%	
Pervious expansion	Yes	4	100%	0	0.0%	0	0.0%	.702
	No	39	84.8%	5	10.9%	2	4.3%	

Fig: (4.7) 19 years old female patient with post burn cicatricial alopecia in Rt vertex and parietal area. Figure(A) patient with the defect before implantation. (B) After full tissue expander expansion. (C) After tissue expander removal and defect reconstruction.

Fig: (4.9) This male patient 20 years old presented 3 years later with severe post burn scalp cicatricial alopecia about 70 % of the scalp and underwent for 2 stages tissue expanders implantation with 2 tissue expanders for each stage. about 40% of the alopecia was corrected by the 2 stages of tissue expanders. Figure (A) pre reconstruction post burn cicatricial alopecia from above (second stage). Figure (B) full tissue expanders expansion. Figure (C) post tissue expanders removal and reconstruction.

Fig: (4.10) Adult male with post pump explosion with facial post burn scarring and pigmentations underwent for 2 tissue expanders for checks reconstruction. Figure (A) pre reconstruction with full tissue expanders. Figure(B) post reconstruction.

Fig: (4.11) 14 years old female patient with post burn ugly scarring in the checks and around mouth and eyes complicated with ectropion.2 tissue expanders implanted at healthy donor areas on the posterior checks. figure (A, B) patient with the defects and after full tissue expanders expansion. figure (C) post tissue expanders removal and defects correction.

fig: (4.12) 23 years old male patient with post injury Rt neck and mandibular area scarring. Rt neck tissue expander implanted. figure (A) after tissue expander full expansion beside the defect. figure (B) after tissue expander removal and defect reconstruction.

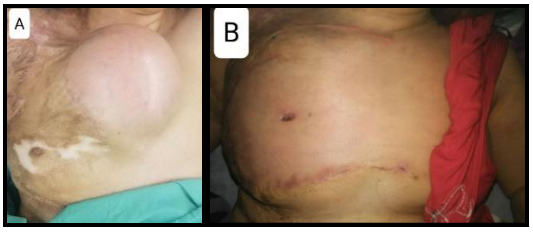

Fig: (4.14) 38 years old female patient with post burn right breast scarring and anatomical breast distortion. tissue expander 450cc capacity implanted above right breast healthy tissue. figure (A) with full tissue expander expansion beside

the distorted breast. Figure (B) after removal tissue expander and reconstruction.

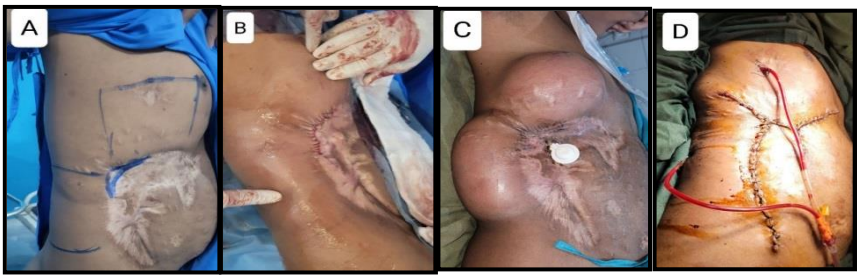

Fig: (4.15) 23 years old male patient with post injury Rt abdominal wall skin defects and scarring.2 tissue expanders implanted in Rt chest and Rt lateral flank. figure (A) areas of tissue expanders implantation marked. figure (B) incision wounds closure after implantation. figure (C) full tissue expanders expansion. figure (D) after removal tissue expanders and defects reconstruction.

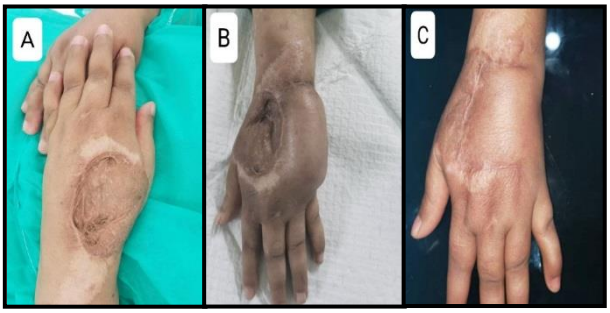

Fig: (4.16) 27 years old female patient with post traumatic Lt hand dorsal defect. figure (A) before tissue expander implantation. figure (B) after tissue expander full expansion. figure (C) after tissue expander removal and defect reconstruction.

DISCUSSION

Tissue expander devices, a procedure that causes various bodily tissues including: skin, muscles, bone, and other tissues, to grow and expand, have been utilized in plastic and reconstructive surgeries for more than 38 years **(Karimi *et al.;* 2019)**.

the results revealed that more than the half of studied patients were female (62.0%); this result was agree with **Motamed et al.;(2009)** and **Gao et al.;(2007),** where the majority of cases in the studies were females 70.59% and 57.17%; respectively. women may be more vulnerable to burns in domestic incidents involving food preparation and fewer safety measures so this could account for the higher proportion of female in this study.

In the current study the result showed that, most of the patients (38.0 %) were in age 18 - 25 years; with a mean age 22.7 ± 7 years. A similar finding was reported by **Wahsh & Shehata, 2018**.

In this study the scalp is most location managed with tissue expander (15 cases) and the cause is burn and this agreed with **Vana et al.; 2021, Fochtmann et al.; 2013,Wahsh & Shehata, 2018 and Alharbi et al.; 2024.**

Regarding to distribution of concomitant tissue expander; concomitant tissue expander usage; in this study showed that in 60% of the cases, there was concurrent use of a tissue expander,while in 40% of the cases, there was not. This result was disagreed with **Vana et al.; 2021**. **Karimi et al.; 2019** they reported in their study that; 42% of patients were satisfied of the results of expansion**;** also **Kang et al.; 2023** reported in their study that the patients were highly satisfied with the surgical results. in this study; more than three-quarters (78.0%) of cases were satisfied. Where the total complications rate were 14 %, classified them with major complications 4% were unsalvageable and the process failed and ends with explantation the device, and minor as 10% where salvageable and the process continued to the end; when we compare our results to **Vana et al.; 2021**; their incidence of complications was 17.95%, dividing them into –minor - 7.75 % and –major - 10.2%.According to **Bozkurt et al.'s (2008)** study, there were 28.4% of complications, of which 18.6% were minor (hematoma, seroma, and delayed healing) and 9.8% were major (infection, extrusion, leakage, dehiscence, and cutaneous necrosis).

Where Moreover, as this study noted, there were a variety of complications, with tissue expander exposure accounting for 6.0% of cases, seroma and wound dehiscence for 2.0%, tissue expander exposure and infection for 2.0%, and tissue expander exposure and seroma for 2.0%. the complications that observed in the beginning in some cases like wound dehiscence and seroma collections, decreased when placed the incision site of device insertion in remote area away from the pocket creation and this has also the advantage of collection salvage where drained it without device extraction, in addition to advantage of early(may be 7days post device implantation) tissue expander inflation.

While tissue expander exposure complication that observed in the beginning of the study in thin subcutaneous tissue area improved when implanted small size tissue expander and prolonged the interval periods of tissue expander inflations settings.

The result of current study was similar to Previous studies;**(Çiloğu & Duran, 2017),(Vana et al.; 2021)**, where there was no significant relationship between age, sex, location of injury, cause, concomitant tissue expander, and previous expansion, with complications of operations.

CONCLUSION

Tissue expansion modality is effective method with superior aesthetic results for post burn and post injuries complications with more than three quarters (78%) satisfied results, and by placing remote incision away from the borders between the defect and donor area, there are decrease in the incidence of wound dehiscence complication and dealt with the collections without device explantation and has advantage the early tissue expander inflation.

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دور ممددات الأنسجة في علاج ندبات وتصبغات ما بعد الحروق والتشوهات الناتجة عن الاصابات في المرضى اليمنيين

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الملخص

تعد زيادة حدوث ندبات وتصبغات ما بعد الحروق و حالات الصلع الندبية بعد الحروق وعيوب ما بعد الإصابات، في جميع محافظات البلاد، بسبب الظروف الصحية والاقتصادية السيئة الناجمة عن الحرب في اليمن، وكانت السبب الرئيس لهذه الدراسة

وقد تم استخدام ممدد الأنسجة لتصحيح هذه الندبات والتصبغات والعيوب باستخدام جهاز ممدد الأنسجة . وتهدف هذه الدراسة إلى إثبات مدى فعالية هذه الطريقة في معالجة هذه الندبات والعيوب وتحديد عوامل نجاحها وفشلها ومعالجة هذه العوامل من أجل تحقيق نتائج جيدة, ومرضية للمرضى.

وبالنسبة لمنهجية هذه الدراسة، فهي دراسة استطلاعية أجريت على 50 حالة، حيث تم استخدام موسعات الأنسجة بسعة 550 - 50 مل في مناطق مختلفة من الجسم خلال فترة العلاج الفترة من يناير 2020 إلى يناير .2024 أكثر من نصف المشاركين (62.0%) كانوا من الإناث و (38.0%) من الذكور .وكان متوسط عمر المشاركين 7.8 ± 22.7 سنة . تقع معظم الإصابات في فروة الرأس (30.0%) ، تليها الرقبة (28.0%) ، الوجه (16.0%)، الأطراف (12.0%) ، الجبهة(8%) ، الصدر (4.0%) والبطن.(2.0%) وكان السبب الأكثر شيوعاً للإصابة هو مضاعفات ما بعد الحروق.

النتيجة : كانت غالبية العمليات ناجحة، حيث أبلغ 78.0% من المرضى عن رضاهم.ولم تظهر على معظم الحالات أي مضاعفات (86.0%) ، بينما كان لدى البعض مضاعفات طفيفة قابلة للإنقاذ (10.0) ٪ (أو مضاعفات كبيرة غير قابلة للإصلاح4.0) ٪ .(لم تجد الدراسة أي علاقة ذات دلالة إحصائية بين متغيرات مثل العمر والجنس ونوع الإصابة و الموقع والسبب واستخدام ممددات الأنسجة المصاحبة واجراء عمليات ممددات في السابق ، على النتائج او المضاعفات.

الاستنتاج : طريقة ممددات الأنسجة هي طريقة فعالة لعلاج مضاعفات الحرق والاصابات مع نتائج مرضية في أكثر من ثلاثة أرباع (78%) ، واجراء الشق الجراحي في مكان بعيدا من جانب التشوه لإدخال الجهاز يعالج بعض المضاعفات كانفتاح الجرح.

الكلمات المفتاحية: ندب- ممدد-جمالي-ندبي-استخراج.

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